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Glucksman et al.

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(54) **ELECTRIC COOKING APPLIANCE WITH REVERSIBLE COOKING ELEMENTS**

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(51) **Int. Cl.**[7] **H05B 3/68**; H05B 3/06; A47J 3/00

(52) **U.S. Cl.** **219/450.1**; 219/524; 219/525; 99/372; 99/378

(58) **Field of Search** 219/450.1, 451.1, 219/468.1, 468.2, 524, 544; 99/372, 339, 340, 377, 378, 379, 380

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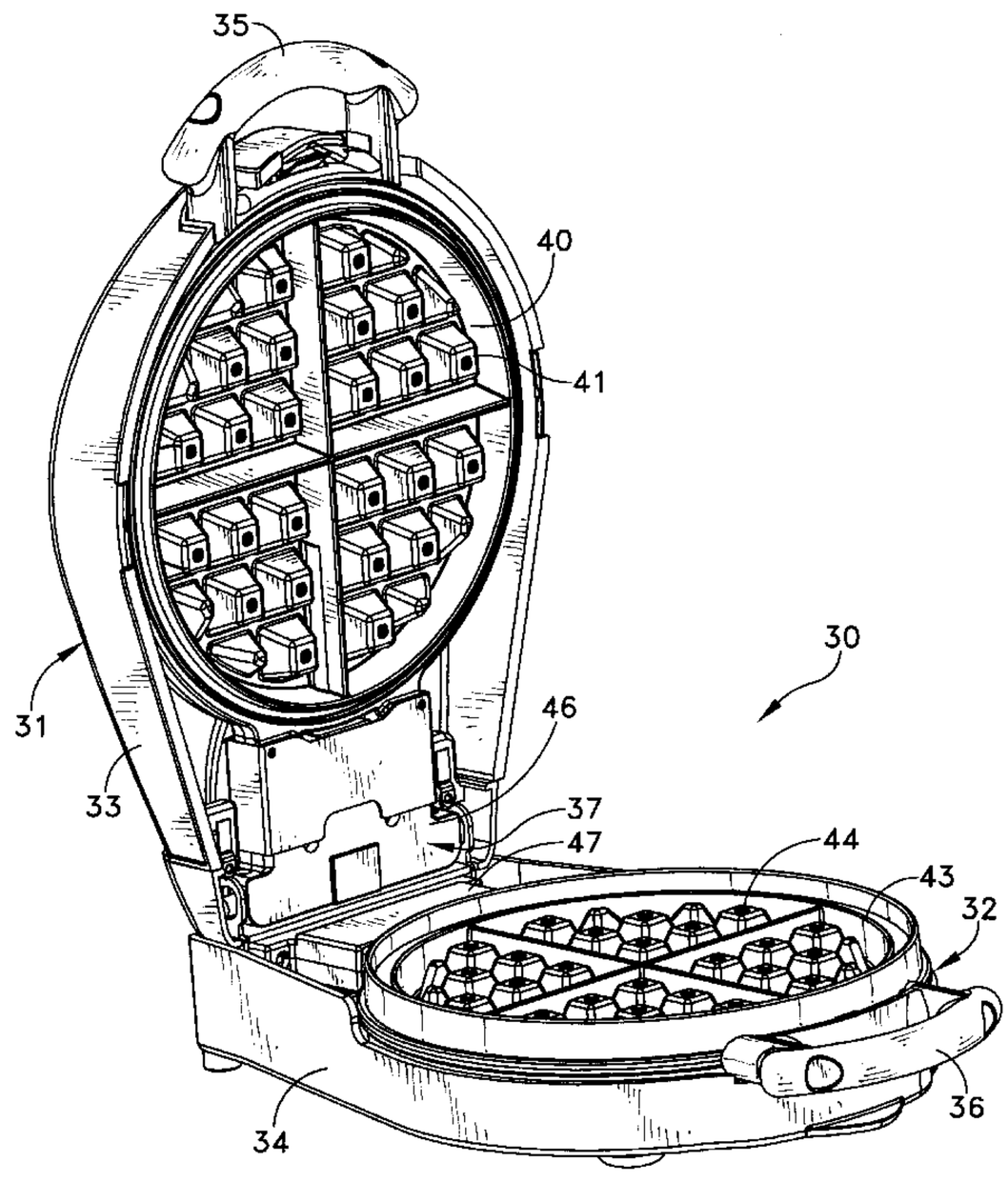
(57) **ABSTRACT**

An electric cooking appliance with reversible cooking elements. A base carries two pivoted contact boxes. Each contact box includes a support surface for receiving a cooking element including a sleeve for supporting the cooking element on the contact box. Each cooking element is molded with an integral, internal heating element and desired cooking surfaces. Reversal of cooking surfaces is accomplished by removing, flipping and reversing the cooking element with its internal heating element on its contact box.

29 Claims, 14 Drawing Sheets



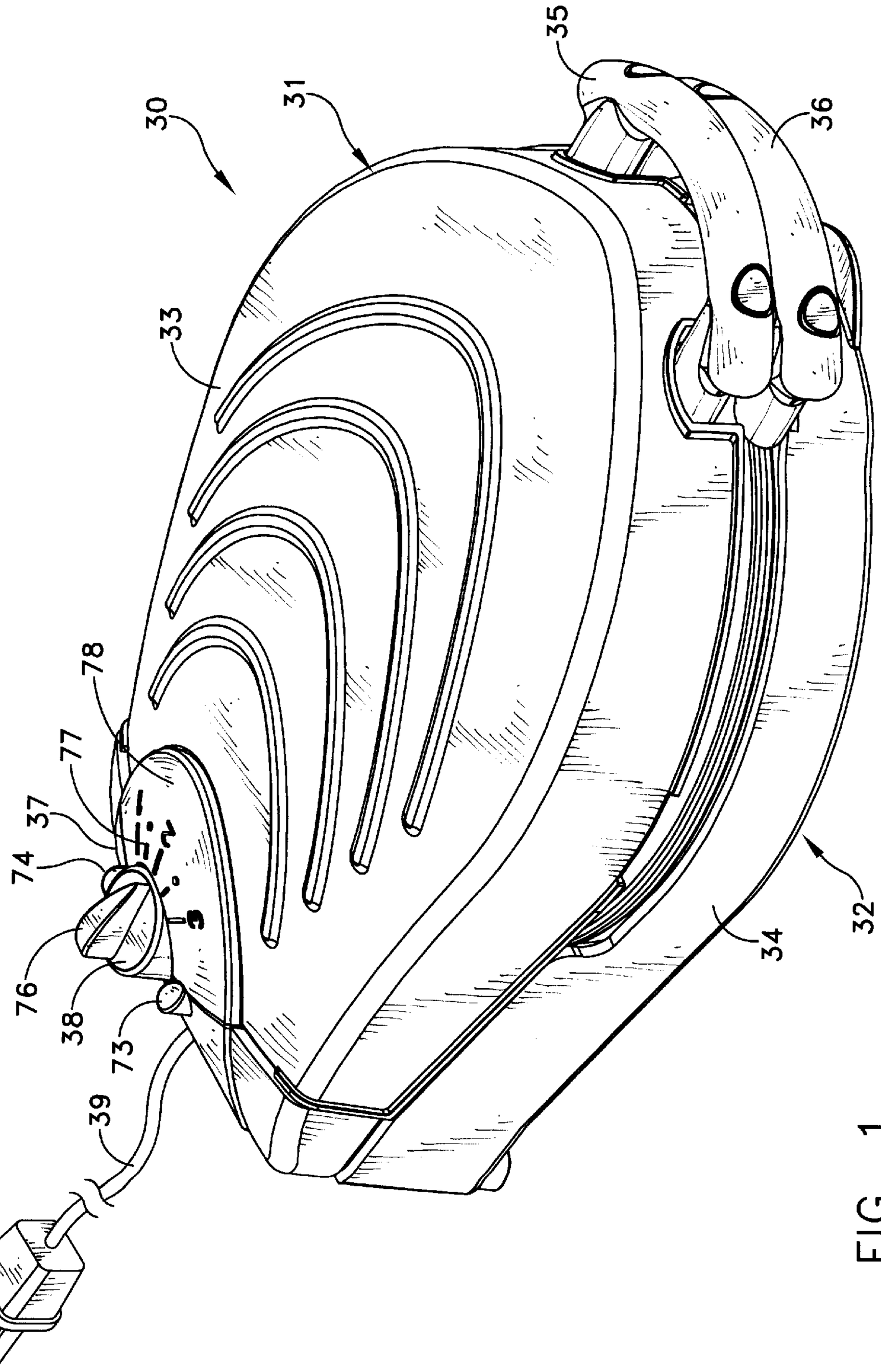


FIG. 1

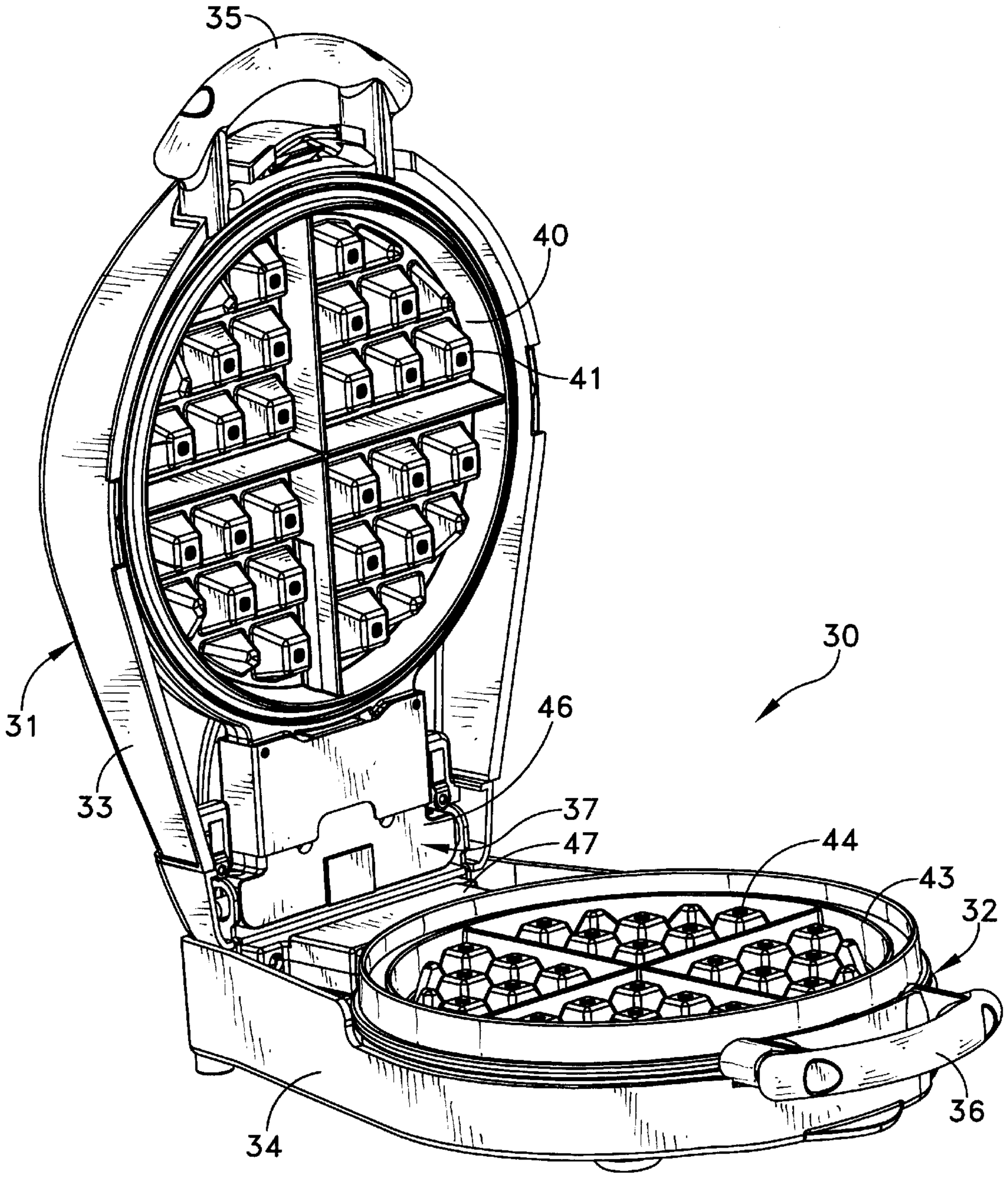


FIG. 2

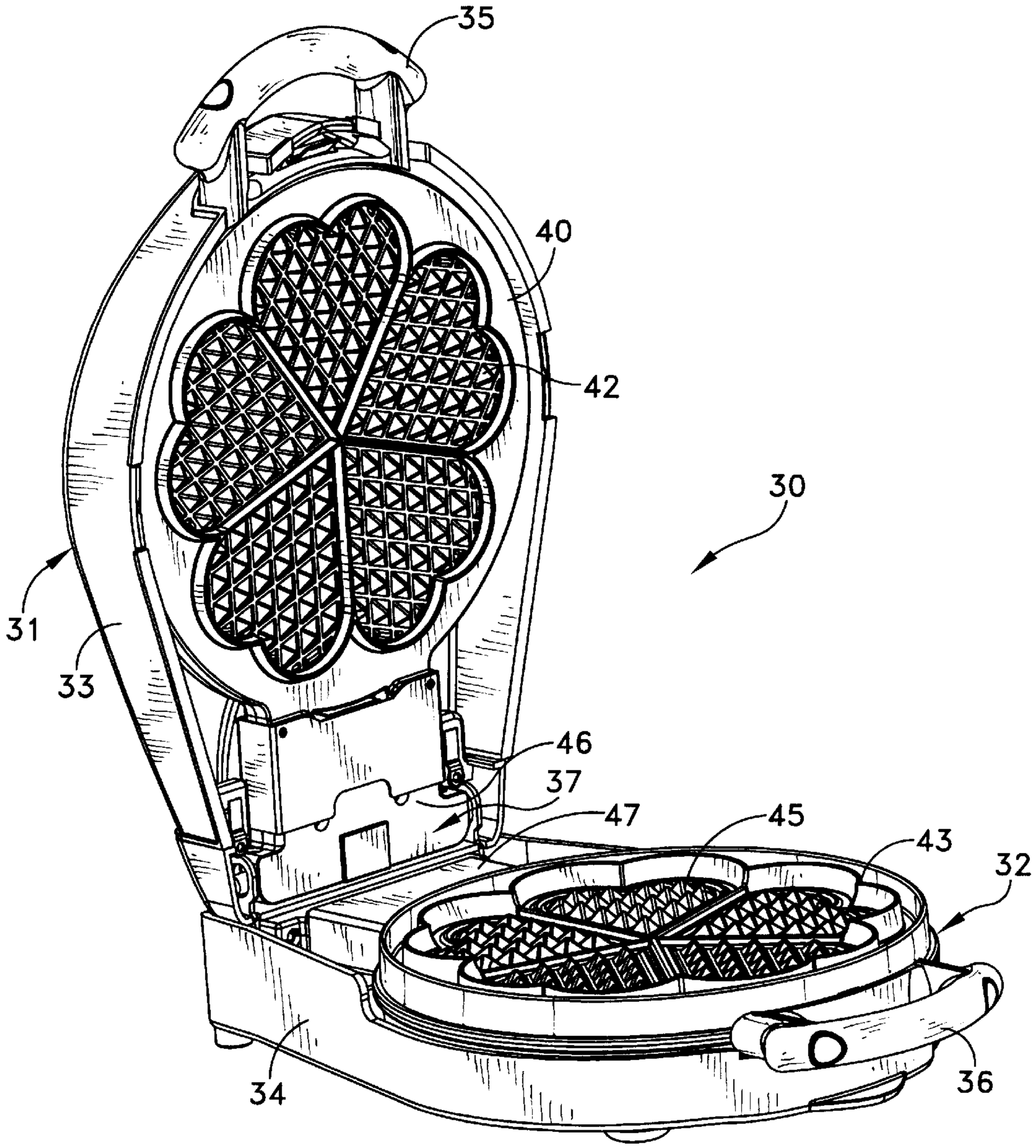


FIG. 3

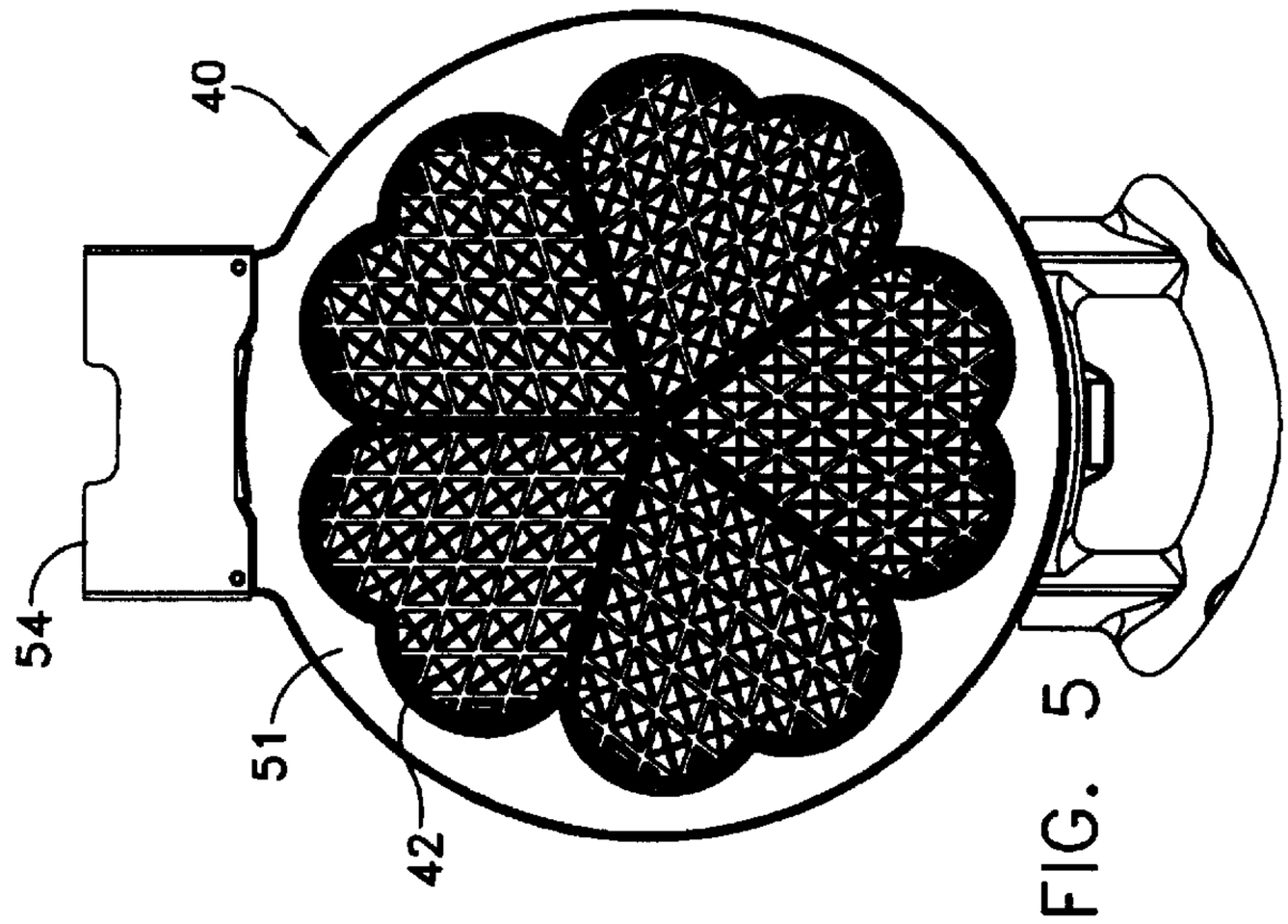


FIG. 5

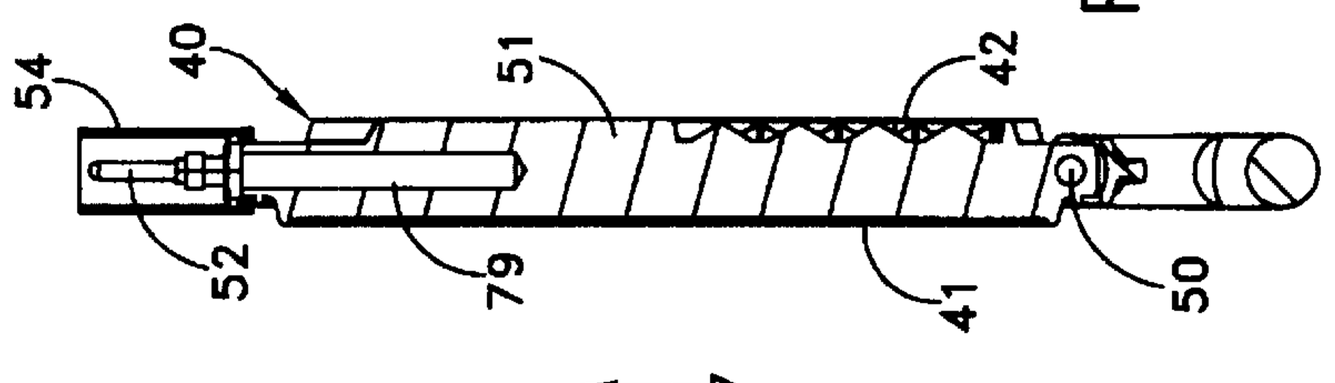


FIG. 6

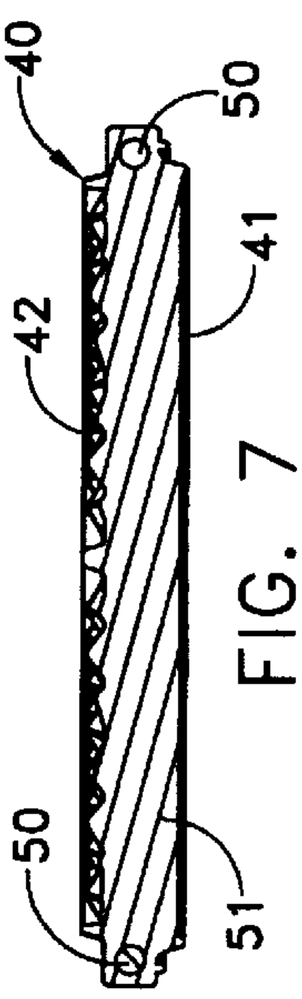


FIG. 7

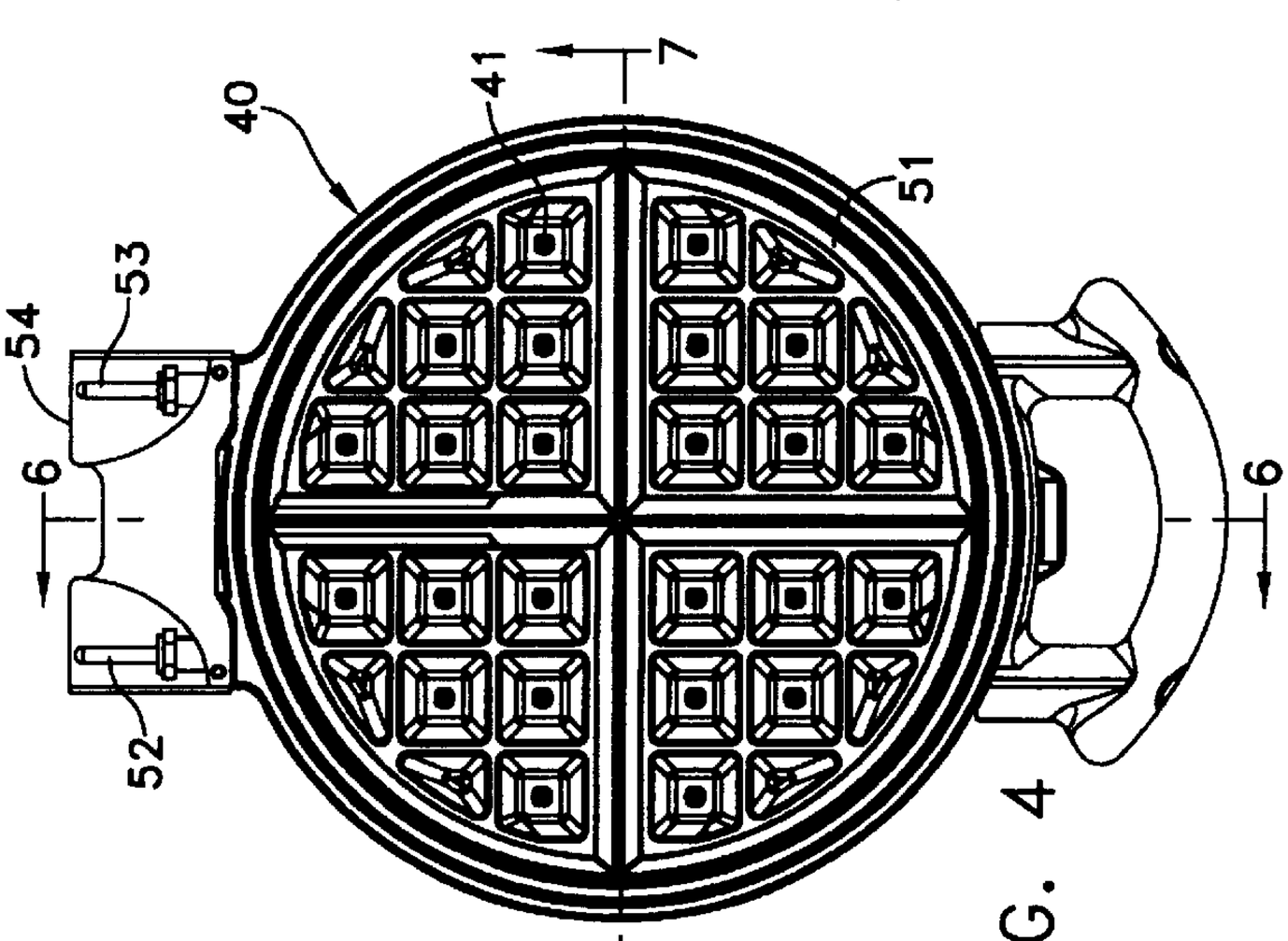


FIG. 4

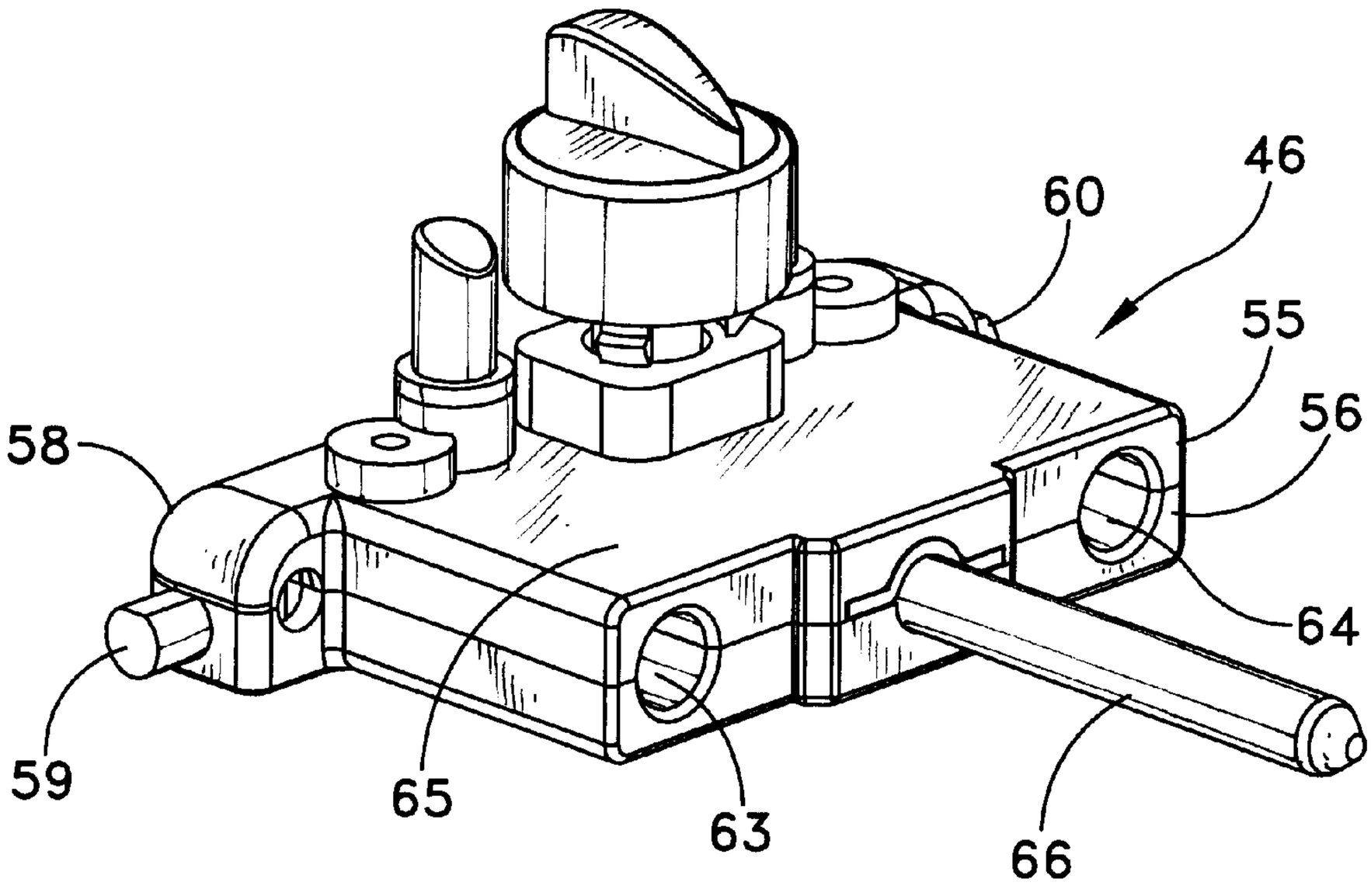


FIG. 8

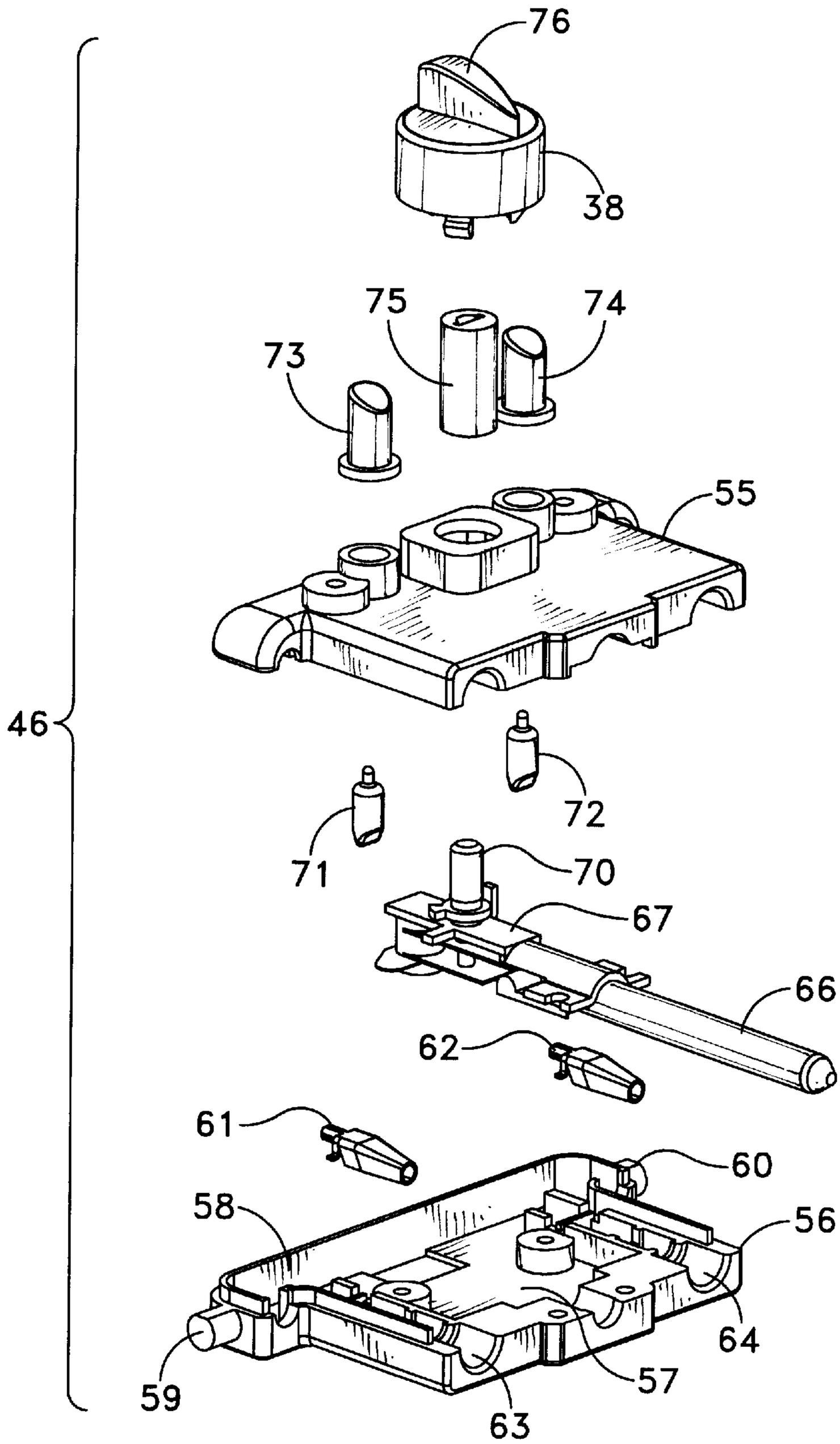


FIG. 9

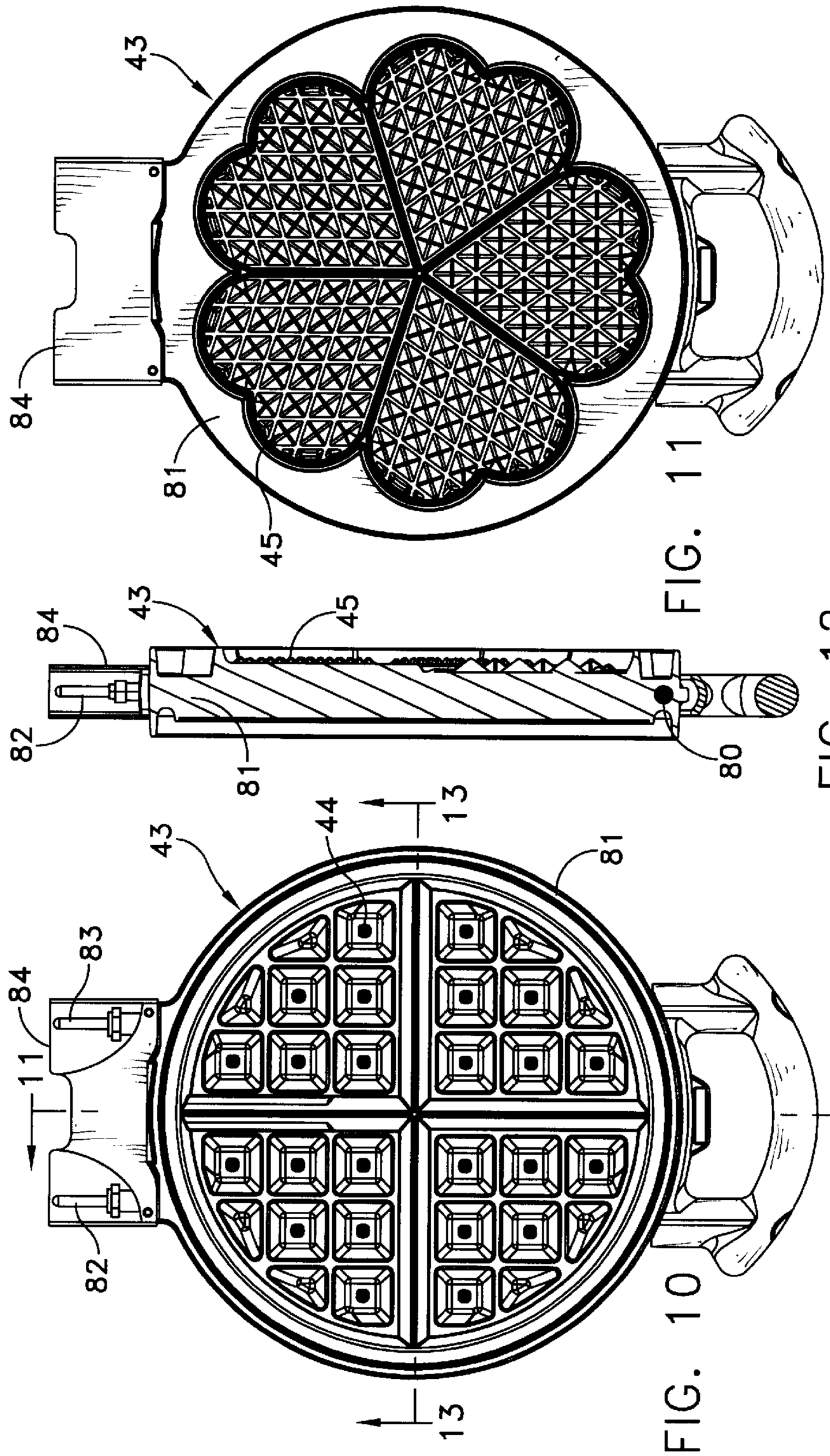


FIG. 11

FIG. 12

FIG. 13

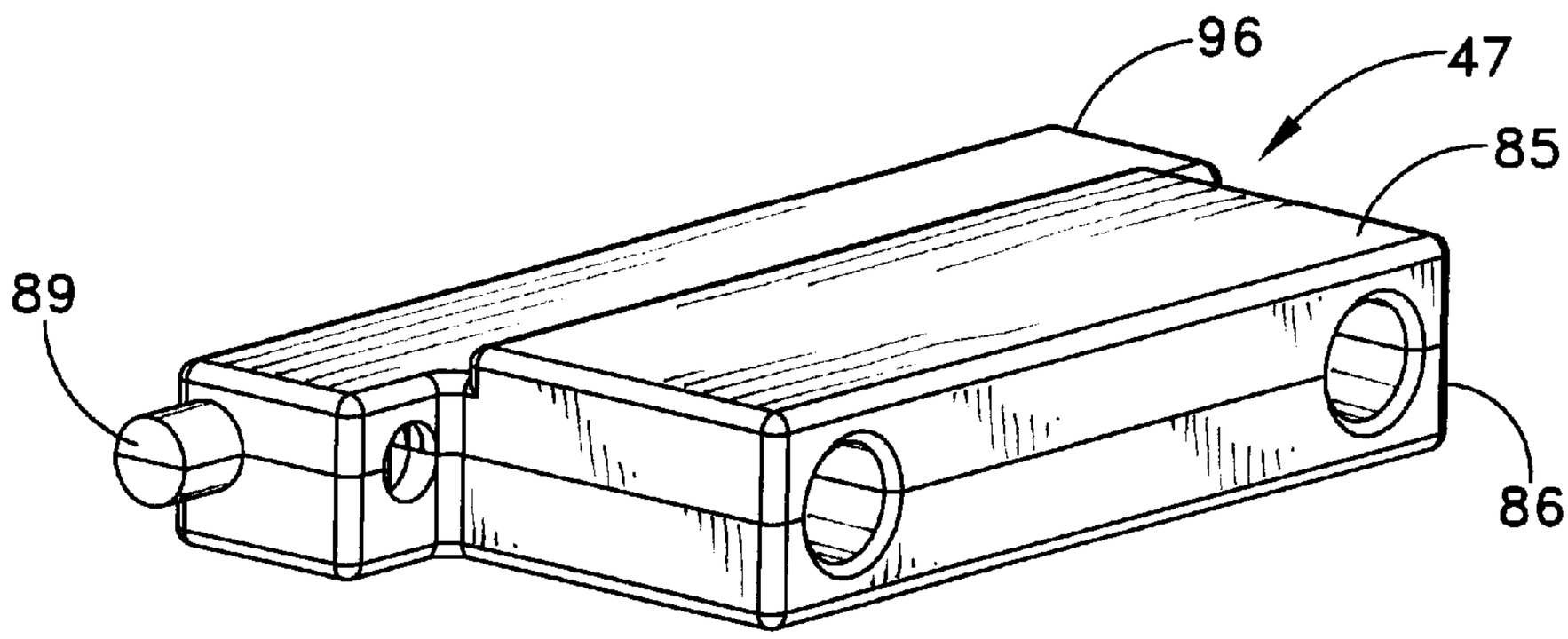


FIG. 14

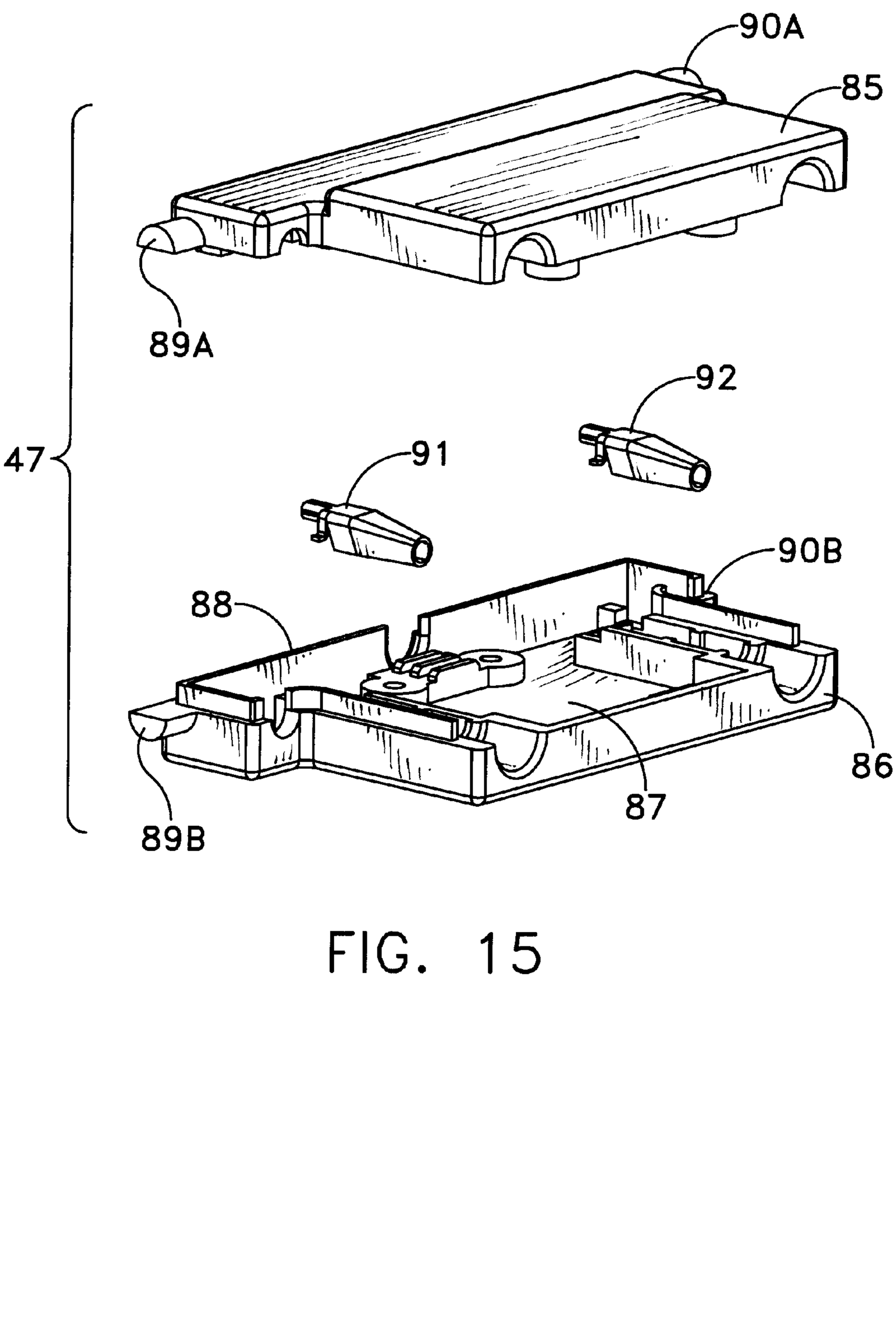


FIG. 15

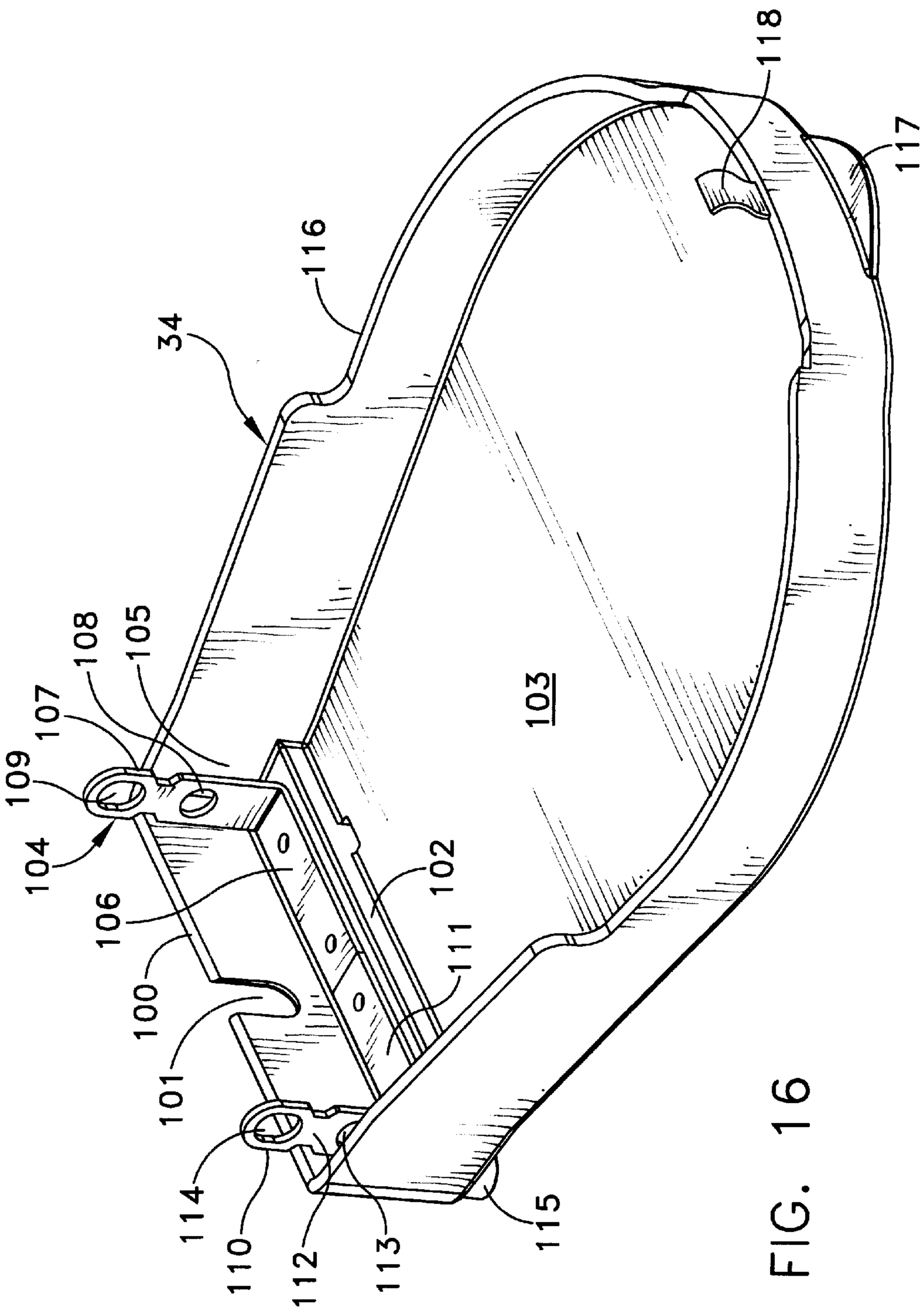

118
117
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FIG. 16

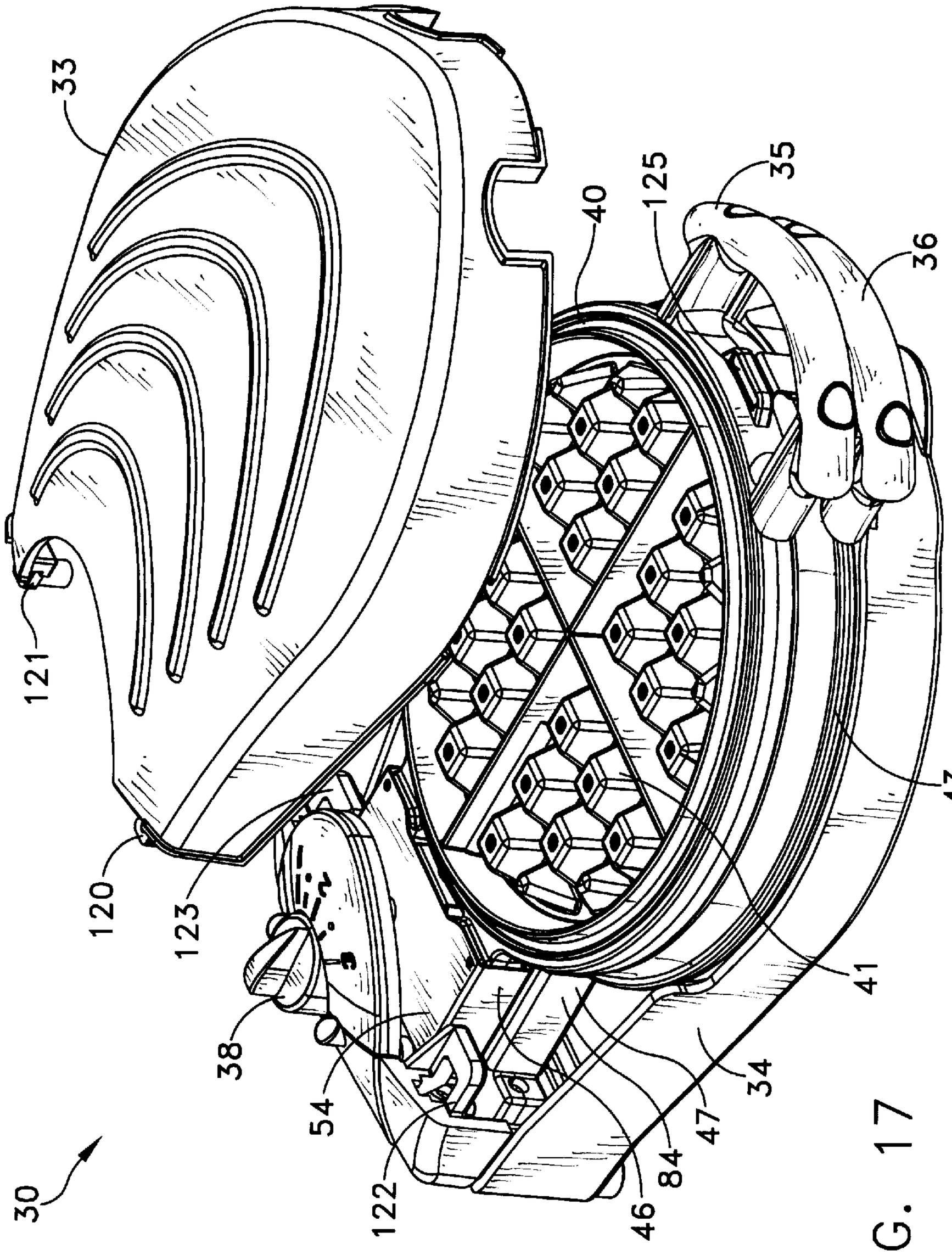

FIG. 17

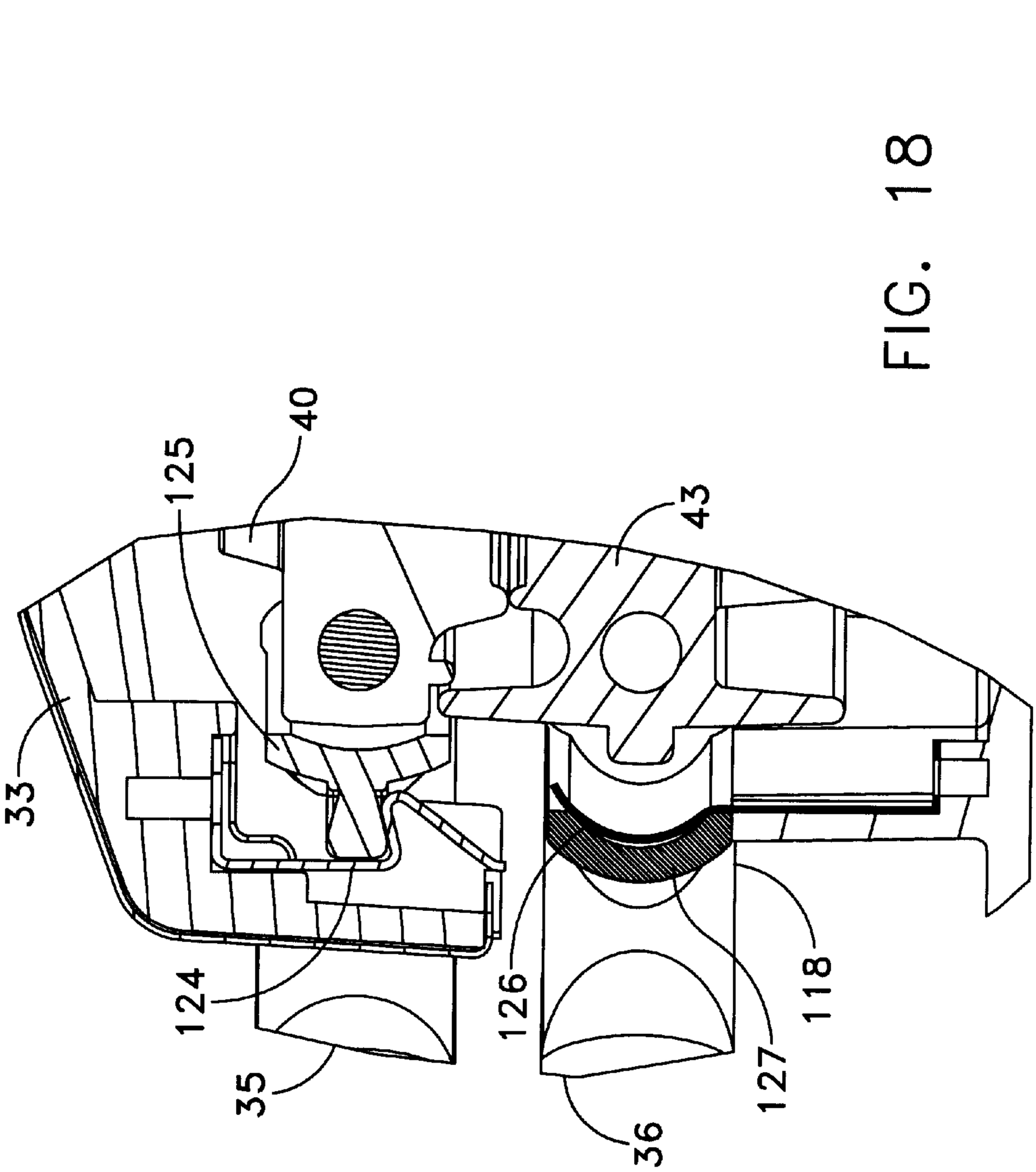

FIG. 18

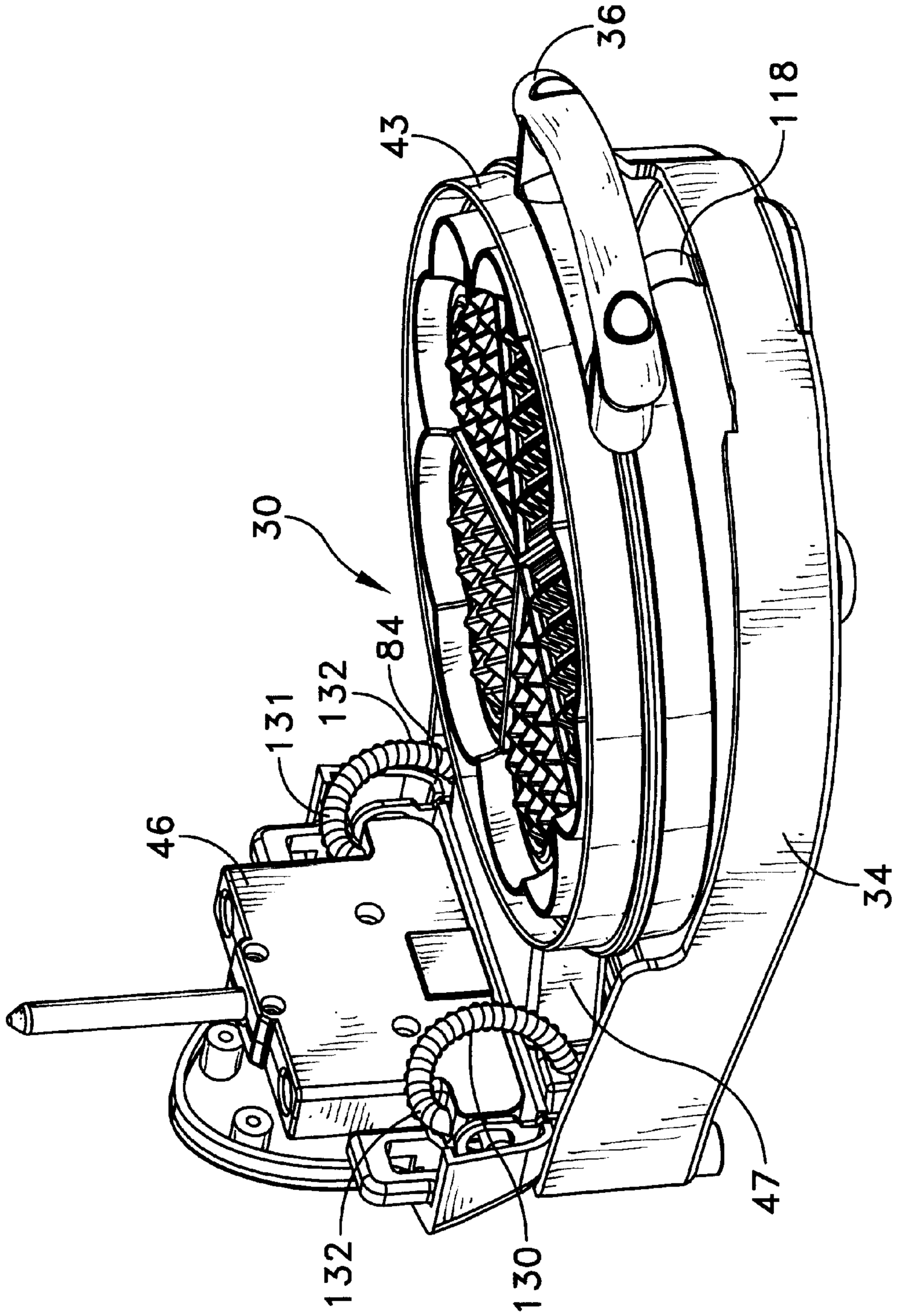

FIG. 19

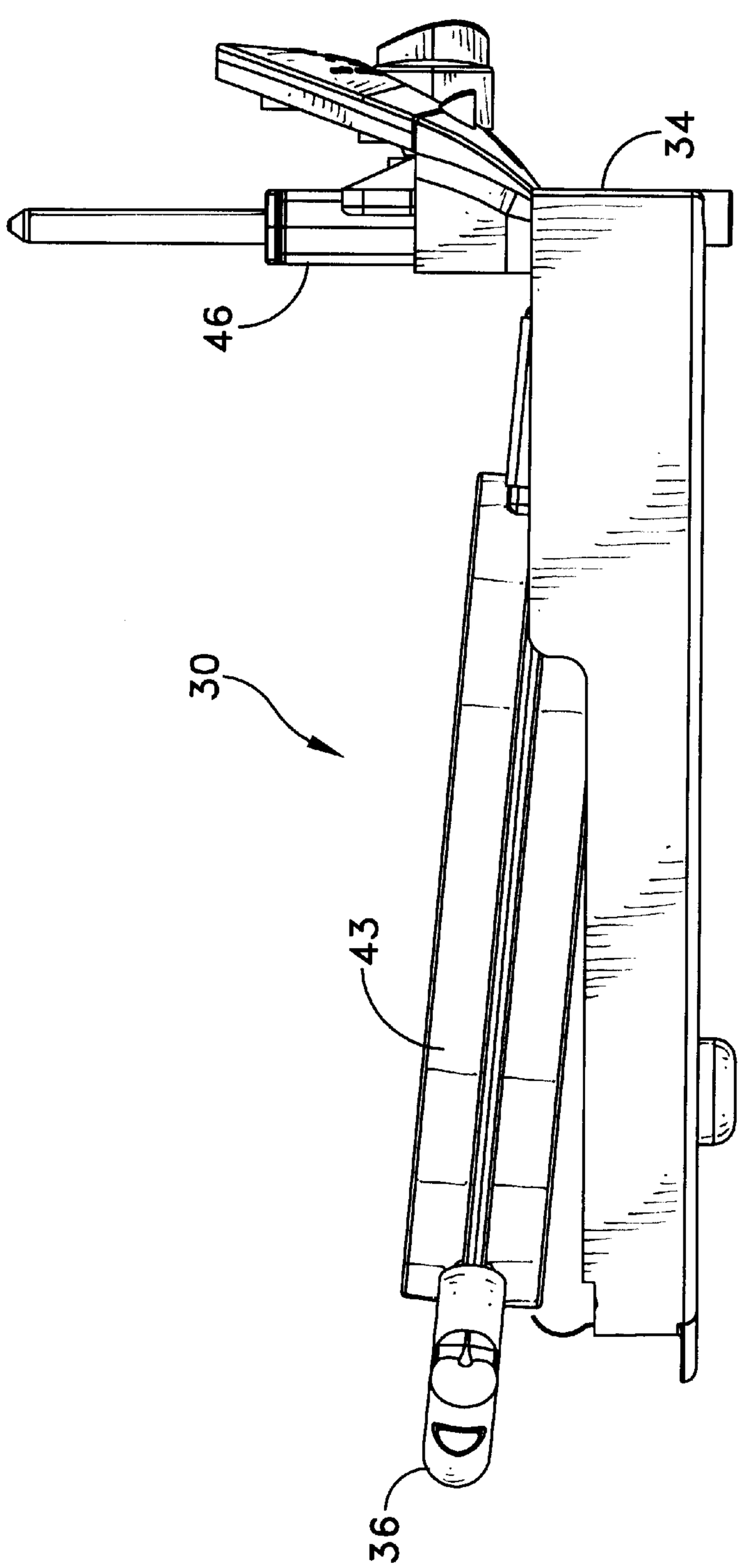

FIG.20

ELECTRIC COOKING APPLIANCE WITH REVERSIBLE COOKING ELEMENTS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to cooking appliances that include reversible grids for cooking different types of food. More specifically, this invention relates to home cooking appliances, such as waffle irons and grills, that can cook two different types of food by means of reversible cooking surfaces.

2. Description of Related Art

A variety of cooking appliances permit cooking of different foods by the use of reversible cooking elements. U.S. Pat. No. 2,899,888 (1959) to Koci discloses one such cooking appliance in the form of a combined waffle baker and grill. This particular appliance has two hinged cases. Each case contains a radiant heating element to one side of a cooking grid. Each grid has a flat cooking surface on one side and waffle cooking surface on the other. To change from one surface to another, each grid is reversed and reinserted into its corresponding case. It has been found that cooking appliances, such as shown in the Koci patent, that use radiant heating of one side of the cooking grid produce uneven heating of the grid and inefficient heat transfer that leads to longer baking times.

Temperature control of a baking surface, as shown in the Koci patent, is obtained by sensing the temperature of separate thermal mass that possess characteristics similar to the cooking grid. This approach does not always provide accurate temperature control of the heating elements themselves.

Reversing the grids requires the grids to be removed. This procedure exposes the heating elements, such as direct heating wires that are subject to damage if contacted. This feature further makes it difficult to clean the interior of such cooking appliances.

U.S. Pat. No. 3,998,145 (1976) to Maisch discloses a combination grilling and baking apparatus with two parts hinged by a pantograph like device. Each part carries a cooking element that has different cooking surfaces. The Maisch patent discloses waffle baking and meat grilling surfaces. Each cooking unit has a central elongated and transverse sleeve. Each hinge part carries a heating element. When a cooking element is installed the heating element inserts into the sleeve.

This apparatus seems to use a conventional bi-metal control for temperature. Like the device shown in the Koci patent, the combination grilling and baking apparatus disclosed in the Maisch patent requires direct handling of the cooking elements and exposure of the heating element when a cooking element is removed for reversal. Further, even with the cooking elements removed, the heating element makes it difficult to clean the remainder of the cooking appliance.

SUMMARY

Therefore it is an object of this invention to provide two reversible cooking surfaces that permit accurate temperature control with even heating.

Another object of this invention is to provide an electrical appliance with two reversible cooking surfaces that enables the reversal of the cooking surfaces without exposing any heating elements.

Yet another object of this invention is to provide an electrical appliance with two reversible cooking surfaces that facilitates cleaning of the entire appliance.

Still another object of this invention is to provide a cooking appliance in the form of a waffle iron that can cook two different types of waffles on reversible surfaces with accurate cooking of such waffles.

In accordance with this invention, an electrical cooking appliance includes a base. A first assembly hinges for rotation on the base about a first axis and the first assembly includes a contact box that electrically and mechanically supports a first two-sided detachable cooking element with an integral, embedded heating element. A second assembly hinges for rotation on the base about a second axis that is parallel to and spaced above the first axis. The second assembly includes a contact box that electrically and mechanically supports a second two-sided detachable cooking element with an integral, centrally embedded heating element. The second contact box includes a controller for the energization of the first and second heating elements.

BRIEF DESCRIPTION OF THE DRAWINGS

The appended claims particularly point out and distinctly claim the subject matter of this invention. The various objects, advantages and novel features of this invention will be more fully apparent from a reading of the following detailed description in conjunction with the accompanying drawings in which like reference numerals refer to like parts, and in which:

FIG. **1** is a perspective view of a waffle iron as an example of a cooking appliance that incorporates this invention;

FIG. **2** is a perspective view of the waffle iron in a loading orientation with a first cooking surface configuration;

FIG. **3** is a perspective view of the waffle iron in a loading orientation with a second cooking surface configuration;

FIGS. **4** through **7** are plan and section views through various portions of a top cooking element shown in FIGS. **1** through **3**;

FIGS. **8** and **9** depict a contact box for use with the top cooking element shown in FIGS. **4** through **7**;

FIGS. **10** through **13** are plan and section views through various portions of a bottom cooking element shown in FIGS. **1** through **3**;

FIGS. **14** and **15** depict a contact box for use with the bottom cooking element shown in FIGS. **10** through **13**;

FIG. **16** is a perspective view of a base for receiving the top and bottom cooking elements;

FIG. **17** is a partially exploded view of the cooking appliance in FIG. **1**;

FIG. **18** is a detailed section that depicts structures for retaining removable cooking elements within their corresponding base and cover units; and

FIGS. **19** and **20** are perspective and plan views of an electrical cooking appliance with its top cooking element removed.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

FIG. **1** depicts a waffle iron **30** with a top assembly **31** and a bottom assembly **32**. The top assembly **31** includes a detachable cover **33**; the bottom assembly includes a base **34**. Handles **35** and **36** attach to upper and lower cooking elements. The upper assembly additionally includes a support **37** that carries a thermostat represented by a temperature control knob **38**. The base **34** receives a power cord **39**.

Elevating the handle **35** raises the upper assembly **31** to a position shown in FIGS. **2** and **3**. In FIG. **2** the handle **35** connects to a top cooking element **40** with an exposed Belgium waffle cooking surface **41**. FIG. **3** discloses a reversible "five of hearts" cooking surface **42** on the top cooking element **40**.

Similarly, FIG. **2** depicts a bottom cooking element **43** attached to the handle **36** with an exposed Belgian waffle cooking surface **44**. FIG. **3** depicts a corresponding "five of hearts" cooking surface **45**. As will become apparent, the Belgium waffle and five of hearts cooking surfaces are merely representative of two diverse surfaces.

Changing from one cooking surface to the other is a simple process. In the position shown in FIGS. **2** and **3**, the cover **33** is detached first. Then the handle **35** is lifted whereupon the top cooking element **40** separates from a contact box **46** that provides electrical and mechanical support for the top cooking element **40**. When the top cooking element **40** is clear of the contact box **46** it can be rotated or flipped and reinserted thereby to transform the cooking surface from the surface **41** in FIG. **2** to the surface **42** in FIG. **3**.

For the bottom cooking element **43**, it is merely necessary to elevate the handle **36** until the bottom cooking element **43** pivots to clear the base **34**, as more clearly described later. Then the handle **36** can be pulled to withdraw bottom cooking element **43** from its electrical and contact box **47**, flipped and reinserted. Thus, the change of cooking surfaces to that shown in FIG. **2** to that shown in FIG. **3** and vice versa is a simple and quick operation.

Now referring to a more detailed description of the waffle iron **30** in FIG. **1**, FIGS. **4** through **7** depict the construction of the top cooking element **40**. The top cooking element **40** is heated by an electric heater **50** embedded at a central plane through a cast aluminum body **51** that is molded with the desired surfaces, such as the surfaces **41** and **42**. The surfaces may be coated with a nonstick material, such as Teflon® or other like material. The electric heater **50** follows a circular path between two male electrical connectors **52** and **53**. The path lies close to the periphery of the aluminum body **40** as particularly shown in FIGS. **6** and **7**. This configuration and placement ensures that no direct contact is made between the heater and the waffle because that would create a hot spot and provides uneven heating. Heat travels uniformly from a perimeter of a disk towards its center with relatively little loss in temperature as the area of heat loss diminishes proportionally to the second power of the distance the heat travels toward the center. In a waffle maker the largest amount waffle dough is concentrated at the outer region of the plate, less heat is needed in the center of the plate.

A rectangular sleeve **54** protects the male electrical connectors **52** and **53** when the top cooking element **40** is removed from its contact box **46**. When the top heating element **40** is inserted, the sleeve **54** covers the end of the contact box **46** for mechanical support. The male electrical connectors **52** and **53** mate with female electrical connectors in the contact box **46**.

FIGS. **8** and **9** depict one embodiment of a top contact box **46** with upper and lower housings **55** and **56**. The lower support housing includes a cavity **57** and a transverse portion **58** that terminates in pivots **59** and **60**. The base **56** carries a pair of spaced female contacts **61** and **62** that are accessible through openings **63** and **64** to the male electrical connectors **52** and **53** as the sleeve **54** slides over the surface **65** of the assembled housings **55** and **56**. The upper and lower housings **55** and **56** additionally support a thermal sensor **66** that extends from a thermostatic control **67** with an adjustment shaft **70**. A pair of neon lamps **71** and **72** indicate two states. Lamp **72** indicates that power is applied.

Lamp **71** indicates that the heating elements have reached the selected temperature. When this unit is assembled, lenses **73** and **74** attach to the upper housing **55** to provide an external indication of the power state as can be seen from FIG. **1**.

The thermostat control knob **38** attaches to a shaft coupling **75** that connects to the thermostat adjustment shaft **70**. A pointer **76** on the control knob **38** identifies a cooking level by pointing at indices **77** on a surface **78**.

Referring again to FIGS. **4** through **6** and particularly FIG. **6**, the top cooking element **40** additionally includes a well **79** that receives the thermal sensor probe **66**. Thus in accordance with another aspect of this invention, the temperature of the top and bottom cooking elements **40** and **43**, as shown in FIG. **3**, are determined by a direct measurement of the temperature of the top cooking element **40**.

FIGS. **10** through **13** depict the bottom cooking element **43** that has an analogous structure to the top cooking element **40**. More specifically, the bottom cooking element **43** includes an electric heater **80** embedded in a body **81**. Like the heater **50** shown in FIGS. **6** and **7**, the heater **80** is embedded at a central plane in a cast aluminum body **81** with the molded surfaces **44** and **45**. The heater **80** follows a circular path adjacent the periphery of the cooking element **43** counterclockwise from a male connector **82** to a male connector **83** that is internal to a rectangular sleeve **84**. Like the sleeve **54** in FIGS. **4** through **6**, the sleeve **84** protects the contacts **82** and **83** when the bottom cooking element **43** is removed from its contact box **47** and provides mechanical support for the bottom cooking element **43** when it is positioned on the contact box **47**. Like the top cooking element **40**, the bottom cooking element **43** may also be coated with a nonstick material such as Teflon®.

FIGS. **14** and **15** depict the bottom contact box **47**. It includes an upper housing **85** and a lower housing **86**. The lower housing **86** has a cavity **87** and a transverse section **88** that terminates with pivots formed when sections **89**A and **90**A on the upper housing **85** mate with sections **89**B and **90**B in the lower housing **86**. The cavity **87** carries two female electrical connectors **91** and **92** receive the male connectors **82** and **83** on the bottom cooking element **43**. The female connectors **91** and **92** also connect to conductors from the power cord **39** shown in FIG. **1** and to the female connectors **61** and **62** in FIG. **9**. As a result the heaters **50** and **80** operate in parallel under thermostatic control. As will be apparent, each conductor will attach to its respective control box with appropriate strain relief components or measures.

By casting the top and bottom cooking elements, it is possible to seal each of the male connectors in the cooking elements, such as the male connectors **52** and **53** for the top cooking element **40** and the male connectors **82** and **83** for the bottom cooking element **43**. Consequently, the cooking elements are not subject to damage by immersion in water. Consequently, it is possible to construct both the cooking elements **41** and **43** to be removed from the appliance **30** and cleaned in a dishwasher.

FIG. **16** depicts the base **34** in more detail to provide an understanding of how the top and bottom cooking elements **40** and **43**, with their respective contact boxes **46** and **47**, are arranged. The base **34** has a rear wall **100** with an access slot **101** for the power cord **39**. Adjacent the rear wall there is a strengthening step **102** formed across a floor **103**. A u-shaped bracket **104** mounts to step **102**. It includes two L-shaped brackets. A first L-shaped bracket **105** has a base **106** and an upstanding arm **107** with two circular apertures **108** and **109**. The second L-shaped bracket **110** has a base **111** and an upstanding arm **112** with apertures **113** and **114**. The apertures **108** and **113** support the pivots **89** and **90** in the contact box **47** respectively, for the lower cooking element **43**. The upper apertures **109** and **114** support the

pivots **59** and **60** on the upper contact box **46** for the upper cooking element **40**. After this assembly, the bracket bases **106** and **111** are affixed to step **102** to lock the contact boxes in place for pivotal action about a first axis through the apertures **108** and **113** and a second, vertically spaced axis through the apertures **109** and **110**.

The base **34** additionally includes a plurality of spaced feet extending from the floor **103**, such as a foot **115** to space the base **34** above any supporting surface for purposes of cooling. The base **34** additionally includes a peripheral wall **116** that covers at least a portion of the bottom cooking element **40**. A uniformly formed finger tab **117** extends from the wall **116** approximately level with the floor **103**. The peripheral wall **116** also carries a spring clip **118** in vertical alignment with the finger tab **117**.

Referring now to FIG. **17**, the base **34** is shown as being supported on a horizontal surface with both the contact boxes **46** and **47** being pivoted to a horizontal position thereby to carry the upper and lower cooking elements **40** and **43** by engagement of the sleeves **54** and **84**, respectively. FIG. **17** depicts the appliance **30** with the cover **33** detached to expose the otherwise covered side of the upper cooking element **40** and the unused cooking surface **41** in FIG. **17**.

More specifically, the cover **33** includes a pair of rearwardly extending tabs **120** and **121** that pass through apertures in brackets **122** and **123**, respectively, that are attached to the control box **46**. This positions the cover and prevents its forward movement. When the cover **33** is fully seated, a spring clip **124** shown in FIG. **18** and located on the inner front edge is lowered over a latch piece **125** extending from and integral with the upper cooking element **40** thereby to latch the cover **33**to the top cooking element **40**. Consequently as the handle **35** moves through an arcuate motion the cover **33** remains in place thereby to provide protection from direct contact with the heating element and provide some cooling as air space exists between the upper cooking element **40** and the surface of the cover **33**.

Referring now to FIGS. **16** and **18**, the lower heating element **43** is held in the base **34** by means of the spring clip **118**. As particularly shown in FIG. **18**, the spring **118** engages a concave portion **126** formed in a back frame member **127** of the handle **36**. This provides a detent structure that keeps the base **34** attached to the lower heating element **43** during transport. As will be apparent, during normal operations the weight of the lower cooking element **43** keeps itself in place.

Whether the cover **33** is removed or replaced the top cooking element **40** can be pivoted to a position that is slightly past the vertical to provide a stable upright position. In this position it is a simple task to release the spring **124** and remove the cover **33**. Then the top cooking element **40** can be removed merely by lifting it while maintaining some downward pressure on the base **34**. When the top cooking element **40** is removed, the bottom cooking element **43** can be removed. Referring specifically to FIGS. **19** and **20**, the bottom cooking element **43** pivots by lifting the handle **36** until it is clear of the base **34**. As this point it is a simple matter to pull the bottom cooking element **43** from its contact box **47**.

As previously indicated, an electrical connection is made between the top contact box **46** and the bottom contact box **47**. FIG. **19** depicts one such connection made by two looped conductors **130** and **131**. Each conductor has a protective coiled spring **132**. The springs provide another benefit. When the top contact box **46** is in a vertical position, the springs **132** tend to pivot the bottom contact box **47** into an upward tilted position. This facilitates subsequent reinsertion of the lower cooking element **43** in either of its positions.

With this invention the typical approach will be to insert one of the two cooking elements, for example, the bottom cooking element **43** on its contact box **47** and then lowering it to a final position where the spring clip **118** engages the handle portion **127**. Then the upper cooking element **40** can be inserted over the thermal coupler probe and onto the contact box **46**. Next the handle **35** can close the upper cooking element **40** on the lower cooking element **43**. The cover can readily be reinstalled by inserting the tabs **120** and **121** through the brackets **123** at a slight angle and then forcing the cover down until the spring **124** engages the latch **125**.

As will now be apparent, an electrical cooking appliance constructed in accordance with this invention meets the various objectives of the invention. The appliance has two reversible cooking surfaces and uses the combination of an embedded heating element in each of the cooking elements and a thermal probe. that measures the temperature of the cooking element to permit accurate temperature control and promote even heating of any material, such as waffle dough or the like, between the cooking elements. The reversal of the cooking elements is accomplished with ease and without exposing any of the heating elements. Consequently, when the two cooking elements are removed, cleaning of the remainder of the electrical appliance is greatly facilitated. Finally, in this specifically disclosed embodiment there is shown a waffle iron that can cook two different types of waffles on reversible surfaces with accurate and even cooking of such waffles on a repetitive basis.

This invention has been disclosed in terms of a specific embodiment and is depicted for example, with circular cooking elements. Other shapes might also be used with different configurations of the internal heating element to be optimized to provide the most efficient and even heating. The cooking elements may be formed of other heat conducting materials and be coated or uncoated. Two specific waffle making surfaces have been disclosed. It will be apparent that any of a wide diversity of cooking surfaces could be substituted for one or both of these surfaces. Therefore, it is the intent of the appended claims to cover all such variations and modifications as come within the true spirit and scope of this invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. An electrical cooking appliance comprising:

A) a base,

B) a first assembly hinged for rotation on said base about a first axis including means for electrically and mechanically supporting a first two-sided detachable cooking element with an integral, embedded heater,

C) a second assembly hinged for rotation on said about a second axis parallel to and spaced above said first axis including means for electrically and mechanically supporting a second two-sided detachable cooking element with an integral embedded heater, and

D) means for controlling the energization of said heaters.

2. An electrical cooking appliance as recited in claim **1** wherein said base includes first and second brackets that provide spaced first and second pivot apertures along each of the first and second axes.

3. An electrical cooking appliance as recited in claim **2** wherein each of said first and second assemblies includes a contact box with pivots for engaging said first and second pivot apertures whereby each of said contact boxes can pivot independently relative to said base.

4. An electrical cooking appliance as recited in claim **3** wherein each contact box and its respective cooking element includes a mechanical coupling that supports the respective cooking element on its respective contact box.

5. An electrical cooking appliance as recited in claim **3** wherein each contact box includes electrical connections and each contact box and its respective cooking element

includes an electrical coupling that electrically connects said heater in the cooking element to the electrical connections in the respective contact box.

6. An electrical cooking appliance as recited in claim **5** wherein each contact box includes a rectangular housing and each cooking element includes a rectangular sleeve for engaging said rectangular housing.

7. An electrical cooking appliance as recited in claim **3** wherein one of said contact boxes includes electrical conductors for connection to an electrical power source and wherein said heater control means includes a temperature controller in one of the contact boxes connected to said electrical conductors and said heater thereby to control the temperature of said cooking element.

8. An electrical cooking appliance as recited in claim **7** wherein said cooking element includes a well facing said contract box and said temperature controller comprises a temperature probe positioned in said cooking element well and a thermostatic control.

9. An electrical cooking appliance as recited in claim **8** additionally comprising an electrical connection between said control boxes whereby said temperature controller controls the temperature in each of said first and second cooking elements.

10. An electrical cooking appliance as recited in claim **3** wherein each of said cooking elements has a different patterned cooking surface on opposite sides thereof.

11. A waffle iron comprising:

A) a base having first and second sets of pivot apertures along lower and upper parallel pivot axes, respectively,

B) a bottom contact box having pivots for engaging said first set of pivot apertures and a top contract box having pivots for engaging said second set of pivot apertures whereby said contact boxes can rotate independently relative to said base about the lower and upper axes, respectively,

C) bottom and top cooking elements, each of said cooking elements having first and second cooking surfaces, an integral embedded heater and mechanical and electrical couplings for attaching said bottom and top cooking elements to said bottom and top contact boxes, respectively, and

D) means in said top contact box connected to said heaters in said bottom and top cooking elements for controlling the energization of both of said heaters.

12. A waffle iron as recited in claim **11** wherein each of the contact boxes and respective cooking elements includes a mechanical coupling that supports said cooking element on its respective contact box.

13. A waffle iron as recited in claim **11** wherein each contact box includes electrical connections to said heater in the cooking element attached to the respective contact box.

14. A waffle iron as recited in claim **13** wherein each of said contact boxes includes a rectangular housing and each cooking element includes a rectangular sleeve for engaging said rectangular housing.

15. A waffle iron as recited in claim **11** wherein said top contact box includes a power cord and wherein said heater control means includes a temperature controller connected to said power cord and said heater thereby to control the temperature of said cooking element.

16. A waffle iron as recited in claim **15** wherein said cooking element includes a well facing said contact box and said temperature controller comprises a temperature probe positioned in said cooking element well and a thermostatic control.

17. A waffle iron as recited in claim **16** additionally comprising an electrical connection between said control boxes whereby said temperature controller controls the temperature in each of said first and second cooking elements.

18. A waffle iron as recited in claim **16** wherein said top control box includes a first lamp for indicating that power is applied to said electrical circuit and a second lamp for indicating that said cooking elements are at the temperature selected by said thermostatic control.

19. A waffle iron as recited in claim **11** wherein each of said mechanical and electrical couplings is symmetrical and detachable where by each said cooking element can be removed from its respective contact box and rotated to present one of two cooking surfaces.

20. A waffle iron as recited in claim **19** wherein each of the cooking surfaces has a different surface pattern.

21. An electrical cooking appliance comprising:

A) a base;

B) first and second two-sided detachable cooking elements each having an integral, embedded heater sealed therein,

C) a first assembly attached to said base including means for electrically and mechanically supporting said first two-sided detachable cooking element,

D) a second assembly hinged for rotation on said base about an axis including means for electrically and mechanically supporting said second two-sided detachable cooking element, and

E) means for controlling the energization of said heaters.

22. An electrical cooking appliance as recited in claim **21** wherein each of said first and second assemblies includes a contact box, said contact box in said assembly having pivots for engaging said base whereby said contact box can pivot relative to said base.

23. An electrical cooking appliance as recited in claim **22** wherein each contact box and its respective cooking element includes a mechanical coupling that supports the respective cooking element on its respective contact box.

24. An electrical cooking appliance as recited in claim **22** wherein each contact box includes electrical connections and each contact box and its respective cooking element includes an electrical coupling the electrically connects said heater in the cooking element to the electrical connections in the respective contact box.

25. An electrical cooking appliance as recited in claim **24** wherein each contact box includes a rectangular housing and each cooking element includes a rectangular sleeve for engaging said rectangular housing.

26. An electrical cooking appliance as recited in claim **22** wherein one of said contact boxes includes electrical conductors for connection to an electrical power source and wherein said heater control means includes a temperature controller in one of the contact boxes connected to said electrical conductors and said heater thereby to control the temperature of said cooking element.

27. An electrical cooking appliance as recited in claim **26** wherein said cooking element includes a well facing said contract box and said temperature controller comprises a temperature probe positioned in said cooking element well and a thermosatatic control.

28. An electrical cooking appliance as recited in claim **27** additionally comprising an electrical connection between said control boxes whereby said temperature controller controls the temperature in each of said first and second cooking elements.

29. An electrical cooking appliance as recited in claim **22** wherein each of said cooking elements has a different patterned cooking surface on opposite sides thereof.

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